

Attorney Docket No. W-0006

REMARKS

This is intended as a full and complete response to the Office Action dated February 7, 2005.

All references to paragraph numbers indicate those of the published application.

Disposition of the Claims

Claims 11 - 18 and 22 - 34 are currently pending and stand rejected.

Amendment of the Claims

Claim 11 is amended to incorporate the limitation that the polymer formed by the process of Claim 11 has $n = 5+$ less than about 8 weight percent. Support for this limitation is found in original Claim 1, previously canceled, and in paragraph [0030] of the application as filed. No new matter is added.

Claims 22, 23, 24 and 26 are amended to clarify the limitation on arm number distribution. The limitation " n is at least 5" is restated as " $n = 5+$ ". This amendment is supported in paragraph [0008] of the application as filed. No new matter is added.

Rejections

Claims 22 - 34 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention. The Examiner notes that Claim 22 recites the limitation "wherein said copolymer is produced by the method of claim 11" and asserts there is insufficient antecedent basis for this limitation in claim 22. Applicant points out that since claim 11 does include the use of a metal alkyl claim 22 does incorporate this limitation by reference. The polymer made in claim 22 is the same as in claim 11 since it is made by the process of claim 11. Applicants respectfully note that a claim which makes reference to a preceding claim to define a limitation is an acceptable claim construction which should not necessarily be rejected as improper or confusing under 35 U.S.C. 112, second paragraph (MPEP 2173.05 (f)). Applicants maintain that claim 22 is proper. Claims 23-34 are rejected because of their dependency on claim 22 and

Attorney Docket No. W-0006

Applicants also maintain these are proper. Applicants respectfully request withdrawal of the rejection.

Claims 11 – 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schade et al. U.S. Patent 6,506,846. Schade et al. teaches a process for preparing impact modified thermoplastics comprising anionically polymerizing a rubber followed by coupling or termination which in turn is followed by initiation of an anionically polymerizable monomer by a metal alkyl compound.

The use of metal alkyls as “retarders” in the context of Schade et al. is taught in column 1, lines 46 – 57. They are used to slow down anionic polymerization in high solids, high concentration situations where heat generation is problematic. Schade et al teaches that metal alkyls may be used as “initiators” after termination or coupling (column 4, lines 28 – 37). And, importantly, Schade et al. teaches that while the metal alkyls can initiate polymerization they “otherwise have only a retarding effect” (column 4, lines 33 – 35). Thus, Schade et al. teaches that the metal alkyl has only two effects: initiation and retardation. There is no teaching or suggestion of any other effect.

Applicants assert that the present invention has found a further effect, heretofore unknown, of metal alkyls. Metal alkyls enhance the coupling reaction and limit the amount of $n = 5+$ species in the coupled polymers (paragraph [0020], last sentence). Claim 11, as amended, now recites the limitation that the claimed process produces a composition in which the amount of $n = 5+$ species is less than about 8 wt%. Without a teaching or suggestion that the metal alkyls would have a further effect, it would not have been obvious to one of ordinary skill in the art to use metal alkyls to enhance the coupling reaction of anionic polymers using ester coupling agents of the present invention.

Furthermore, without any teaching or suggestion of a further effect of metal alkyls by Schade et al. there is no motivation for one of ordinary skill in the art to add the metal alkyl before coupling as is done in the present invention. In fact, this would be away from the teaching of Schade et al. that specifies that the metal alkyl is necessarily added after coupling or termination. Thus, Schade et al. provide no reasonable expectation of success to one of ordinary skill in the art to make the present invention in which the metal alkyl is added before coupling to

Attorney Docket No. W-0006

enhance the coupling reaction and provide a composition with $n = 5+$ less than about 8 weight percent.

For the above reasons, Applicants assert that a *prime facie* case of obviousness has not been established by the Examiner basis Schade et al. Applicants respectfully request reconsideration of Claims 11 - 18 and withdrawal of the rejection.

Claims 22- 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Dillman et al U.S. Patent 5,420,203 in view of Schade et al. U.S. Patent 6,506,846. The Examiner correctly points out that Dillman et al. discloses radial block copolymers having the structure $(A - B)_nX$ where X can be a residue of an ester coupling agent (column 3, lines 57 - 64) and that a diblock content of 10 to 75% is taught (Claim 2). The present invention is an improvement over the typical ester coupled radial block copolymers. Nowhere does Dillman et al. teach the importance of the distribution of arms (ie., $n = 1$ diblock, $n = 2$ triblock, $n = 3$ three-armed radial, etc.) other than the diblock content. Thus, Dillman et al. provides no motivation to make any improvement in the distribution of arms during coupling. In fact, the general teaching of Dillman et al. that "high coupling efficiencies are desired" (column 4, lines 14 - 15) suggests that $n = \text{large}$ is desirable.

Claims 22 - 34 of the present invention claim a coupled, radial polymer in which $n = 5+$ is less than about 8% wt. The coupling reaction of the present invention, like all other coupling reactions, does not yield a single species. There will be uncoupled arms ($n = 1$), two arms coupled together ($n = 2$), three arms coupled together ($n = 3$) and so on, all making up the coupled polymer composition. It is clear from the Applicants' discussion of the coupling process in [0023] - [0025] and in Table 1 of the Examples that an arm number distribution results from the coupling reaction.

Table 1 of the present application, which shows the distribution of coupled species clearly demonstrates the unexpected advantage of coupling in the presence of metal alkyls on the polymer composition. Examples 1 - 5 show that when metal alkyls are present in a metal alkyl / lithium ratio of about 1. The amount of $n = 5+$ is equal to or less than 5.3 wt%. Comparative Example 6 shows that when metal alkyls are absent a coupling distributions results in which the $n = 5+$ makes up 12.1 wt%. This is 2 to 5 times higher than the $n = 5+$ amount achieved in the

Attorney Docket No. W-0006

present invention. Only when metal alkyls are present during coupling are the inventive arm number distributions with $n = 5+$ less than about 8 wt% achieved. Table 1 shows that high coupling efficiencies are simultaneously maintained. The advantage of this polymer composition with $n = 5+$ less than about 8 wt% is generally presented in [0008] where it is said that the compositions having only $n = 5$ have a substantially greater viscosity than those having only $n = 3$. Increases in viscosity are not desirable.

Schade et al. as discussed above does not teach, suggest or motivate one of ordinary skill in the art to use metal alkyls during a coupling reaction. In fact, the teaching of Schade et al. where the metal alkyl is not present during coupling, would yield the same result of Comparative Example 6 with $n = 5+$ about or greater than 12 wt%. Therefore, Schade et al. in combination with Dillman et al. cannot render the present invention obvious. Applicants maintain that the present claims 22 – 34 are patentable over Dillman et al. in view of Schade et al. and respectfully request that the rejection be withdrawn.

Having addressed all issues set out in the Office Action, Applicants respectfully submit the claims are in condition for allowance and respectfully request that the claims be allowed.

Respectfully submitted,

Date: April 19, 2005



Michael A. Masse
Registration Number 53,281
KRATON Polymers U.S. LLC
3333 Highway 6 South, Rm. CA-110
Houston, Texas 77082
281-668-3154 (Phone)
281-668-3239 (Fax)